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Research Article

COMPARATIVE CLINICAL STUDY OF *KADAMBA* (*ANTHOCEPHALUS CADAMBA* (ROXB.) MIQ) BARK AND LEAF IN *MEDOROGA*

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KEYWORDS: *Kadamba*, Hyperlipidemia, *Medoroga, Anthocephalus cadamba.*

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ABSTRACT

W.H.O. recognized Ayurveda as the first and foremost system of medicine in the world. Ayurveda is the ocean of knowledge of life science. It is still existing and fighting with the present situations because of its efficiency. In the present trend, plants are extensively used by man for maintenance of health and for the treatment of myriad of illness. Now days, due to sedentary lifestyle, industrialization, urbanization, lack of non spiritual health and lack of exercise especially change in food habits lead to clinical entity known as hyperlipidemia which is the major cause of many other disorders. *Kadamba* is one of the easily available medicinal plants which is mentioned in *Brihatrayee* and *Nighantus* like *Raja Nighantu*, *Bhava prakasha* etc. In *Sushruta Samhita,* it was mentioned in *Nyagrodadi gana* and *Rodradi gana* in *Sutra Sthana* 38th chapter. These drugs have *Karmas* like *Kaphaghna, Medohara, Varnya, Vishaghna, Sthambhana, Asthi Bhaghna sandhanakara* and indicated in diseases like *Medoroga, Prameha, Yoniroga* etc. It is an attempt to prove the clinical efficacy of leaf along with bark to conserve the trees. The present study evaluated the clinical efficacy of *Kadamba* (*Anthocephalus Cadamba* (Roxb.) Miq) in *Medoroga* w.s.r. to Hyperlipidemia and also comparative efficacy of bark and leaf by studying in 30 patients divided into 2 groups for a period of 40 days and results are assessed and observed that *Kadamba (Anthocephalus cadamba* (Roxb.) Miq) bark and leaf are clinically effective in *Medoroga* and leaf is little more efficacious than bark and it is a drug of choice in the management of *Medoroga*.

INTRODUCTION

In today's world, sedentary lifestyle, faulty dietary habits including ready- to- eat fast food, stress during the work results into the disturbance of digestion and metabolism ultimately leading to many lifestyle disorders. *Medoroga* is one of these diseases which have taken a toll on whole generation's health. It is emerging as an important health problem in India also. The symptoms of *Medoroga* are *Kshudra Swasa, Pipasa Atiyoga, Kshut Atimatra, Sareera Dourghandya, Anga Saithilya, Atinidra and Utsahahani.*[1] Here *Medoroga* can be termed as Hyperlipidemia which provides the platform for so many diseases like hypertension, ischemic heart diseases, diabetes, osteoarthritis, infertility, impotency as well as psychological disorders like stress, anxiety and depression etc. Hyperlipidemia is the term used to denote raised serum levels of one or more of total cholesterol, low-density lipoprotein cholesterol, triglycerides, or both total cholesterol and triglyceride (combined hyperlipidemia). However, there is no precise terminology for hyperlipidemia in Ayurveda. Various attempts are made to use distinctive nomenclature to denote the word Hyperlipidemia is *Medoroga* or *Medodosha.* In *Sushruta Samhita, Kadamba* was mentioned in *Nyagrodadi gana* and *Rodradi gana* in *Sutra Sthana*[2]. These drugs have *karmas* like *Kaphaghna, Medohara, Varnya, Vishaghna, Sthambhana, Asthi Bhaghna sandhanakara* and indicated in diseases like

Medoroga, Prameha, Yoniroga etc. Several single drugs are described in Ayurveda for the treatment of *Medoroga*. Thus, considering the lack of definite Ayurveda comprehension as well as the magnitude hyperlipidemia is causing life threatening diseases, the present clinical study has been planned with Bark and Leaf of *Kadamba.* The drug *Kadamba* (*Anthocephalus Cadamba* (Roxb.) Miq) is selected in *Medoroga* for the present study as it is nontoxic, cost effective, can be administered orally, it has *Sita Virya, Katu Vipaka, Kashaya, Tikta Rasas* and *Kapha Medohara*[3] property and many research activities experimentally proved the hypolipidemic activity.[4-6]

Aim and Objective

1. To Evaluate Clinical efficacy of *Kadamba (Anthocephalus cadamba* (Roxb.) Miq) in the management of *Medoroga.*
2. To Evaluate the Comparative Clinical efficacy of *Kadamba (Anthocephalus cadamba* (Roxb.) Miq) bark and leaf in the management of *Medoroga.*

Material and Methods

Kadamba (*Anthocephalus Cadamba* (Roxb.) Miq) bark and leaf are collected from Vikarabad forest near Hyderabad, Telangana state. Genuine and good quality material which are free from any worm infection were cut and separated, washed, dried in shade and stored in air tight dried container. Fine powder is prepared by using pulveriser and stored in airtight containers. This powder is packed in zip lock covers and is used for the purpose of clinical study.

Figure 1: Bark

Figure 2: Bark Powder

Figure 3: Leaf

Figure 4: Leaf Powder

Selection criteria: A total of 30 patients are selected randomly from OP of Dravyaguna department of PG unit, Dr. BRKR Govt. Ayurvedic Hospital, Erragadda, Hyderabad. The treatment is planned for 40 days with follow up of 20 days and as per necessity. The patients are divided into 2 groups A and B. Group A was treated with *Kadamba Bark* fine powder and Group B with *Kadamba* leaf fine powder at a dose of 3gms twice a day with lukewarm water. The patients are categorized according to their age, sex, occupation, socio economic status, diet, cardinal symptoms.

Inclusive criteria: Patients were selected for the study irrespective of sex, occupation according to the following criteria for inclusion.

1) Subjects with signs and symptoms of *Medoroga – Angagaurava, Atisweda, Alasya, Atinidra, Kshudra swasa, Ati kshut, Ati pipasa.*
2) Age group above 20 years and below 60 years.
3) Raised levels of Lipid Profile. (TC, LDL-C, VLDL-C, Triglycerides).

Exclusive criteria

Certain patients were excluded from the study as per the below criteria:

1) Age below 20 years and above 60 years

2) Obesity secondary to or associated with Hypothyroidism, Hypertension, Diabetes Mellitus or Cushing's syndrome.
3) Any concomitant serious disorder of the liver, kidneys, heart, lungs or other organs.
4) Pregnant and Lactating women
5) Person undergoing treatment for any other serious illness like Carcinomas.

Subjective Parameters: 1) *Angagaurava,* 2) *Atinidra,* 3) *Atisweda,* 4) *Utsahahani,* 5) *Ksut atimatra,* 6) *Pipasa atiyoga,* 7) *Kshudraswasa.*

Objective parameters

Lipid Profile: Serum Total Cholesterol, HDL, LDL, VLDL, Serum triglycerides

Method of assessment: The patients registered for clinical trial were examined clinically and the findings were recorded in a specially prepared case sheet. Patients were advised for laboratory investigations before and after treatment. All the patients are advised to come for review at regular intervals of 20 days till 40 days. After 40 days of treatment the results were noted.

Assessment Criteria: The improvement of the patients was assessed by adopting standard scoring pattern for signs and symptoms of the disease. The assessment of subjective parameters was done by giving individual scores to signs and symptoms and percentage of result was assessed in each group for each sign or symptom and for every patient. The gradation of signs and symptoms as per classics is given by sign 1 (mild), 2 (moderate) and 3 (severe). The total signs are counted. The absence of signs and symptoms is given by 0 sign. For each and every character individual scoring was given for before and after treatment and percentage relief was calculated. According to the severity of the symptoms grading were given as below:

Score Assessment

Subjective parameters

0 - No Symptom
1 - Mild
2 - Moderate
3 - Severe

Criteria of result assessment

1. Mild relief : 25% to 50%
2. Moderate relief : 51% to 75%
3. Good relief : 76% to 100%

Objective Parameters

The assessment of objective parameters was based on the below table. The value of each entity of the lipid profile after treatment is marked as per the table and improvement is assessed. Criteria for diagnosing hyperlipidemia and assessment of lipid profile are according to NCEP guidelines.

Table 1: Criteria For Diagnosing Hyperlipidemia and Assessment of Lipid Profile (NCEP Guidelines)[7]

Total Cholesterol- TC (mg/dl)	
< 200	Desirable
200-239	Borderline
>240	High
LDL Cholesterol (mg/dl)	
<100	Optimal
100-129	Near/Above Optimal
130-159	Borderline
160-189	High
>190	Very High
HDL Cholesterol (mg/dl)	
>59	Great
45-59	Desirable
<40	Risk
Triglycerides TG (mg/dl)	
<150	Normal
150-199	Borderline
200-499	High
500	Very High
VLDL Cholesterol(mg/dl)	
< 32	Desirable
>32	High

Statistical Analysis: Clinical symptoms and laboratory parameters are analyzed using appropriate statistical methods. Wilcoxon Test and Paired T test are the tests used to analyze statistical significance in the present study.

Results and Discussion

Subjective Parameters

In Group A out of 15 patients *Utsahahani* was exhibited by 13 (86.67%) patients, *Kshudraswasa* was exhibited by 13 (86.67%) patients, *Atinidra* was exhibited by 12 (80%) patients, *Kshutatimatra* was exhibited by 11 (73.33%) patients, *Sandhisoola* was exhibited by 14 (93.33%) patients, *Angasaithilya* was exhibited by 11 (73.33%) patients.

In Group B out of 15 patients *Utsahahani* was exhibited by 13(86.67%) patients, *Kshudraswasa* was exhibited by 13 (86.67%) patients, *Atinidra* was exhibited by 12 (80%) patients, *Kshutatimatra* was exhibited by 12 (80%) patients, *Sandhisoola* was exhibited by 15 (100%) of patients, *Angasaithilya* was exhibited by 13 (86.67%) patients respectively.

Table 2: Symptomatic Relief Before And After Treatment In Group-A

Symptoms	B.T	A.T	Difference	Percentage
Utsahahani	33	11	22	66.67%
Kshudraswasa	32	4	28	87.5%
Atinidra	24	9	15	62.5%
Kshutatimatra	24	10	14	58.33%
Pipasaatiyoga	32	6	26	81.25%
Sandhisoola	33	5	26	84.84%
Angasaithilyam	25	8	17	68%

B.T – Before Treatment, A.T – After Treatment

After assessment of the signs and symptoms and analysis of the results, it was observed that the percentage relief of symptoms In Group-A with *Kadamba* bark powder was of *Utsahahani*-66.67%, *Kshudra swasa*-87.5%, *Atinidra*-62.5%, *Kshutatimatra*-58.3%, *Pipasaatiyoga*-81.25%, *Sandhisoola*-84.84%, *Angasaithilyam*-68% respectively.

Table 3: Symptomatic Relief Before and After Treatment In Group-B

Symptoms	B.T	A.T	Difference	Percentage
Utsahahani	27	5	22	81.48%
Kshudraswasa	28	3	25	89.3%
Atinidra	19	6	13	68.42%
Kshutatimatra	15	5	10	66.7%
Pipasaatiyoga	18	6	12	66.7%
Sandhisoola	34	5	29	85.3%
Angasaithilyam	24	6	18	75%

B.T – Before Treatment, A.T – After Treatment

In Group-B with *Kadamba* leaf powder, the individual symptoms inferred the percentage of relief *Utsahahani*- 81.48%, *Kshudra swasa*-89.3%, *Atinidra*-68.42%, *Kshutatimatra*-66.7%, *Pipasaatiyoga*-66.7%, *Sandhisoola*-85.3%, *Angasaithilyam*-75% respectively.

Table 4: Statistical Data Showing Symptomatic Relief Before and After Treatment with *Kadamba* Bark Powder in Group-A

S.No.	Symptoms	MEAN ± SD		MD	P value
		BT	AT		
1	*Utsahahani*	2.2±0.94	0.73±0.70	1.47	0.00096
2	*Kshudraswasa*	2.1±0.83	0.25±0.45	1.85	0.00096
3	*Atinidra*	1.6±0.91	0.6±0.74	1.0	0.00338
4	*Pipasaatiyoga*	2.07±0.96	0.40±0.63	1.67	0.00222
5	*Kshutatimatra*	1.80±1.01	0.67±0.49	1.13	0.00222
6	*Sandhisoola*	2.20±0.68	0.33±0.49	1.87	0.00064
7	*Angasaithilyam*	1.67±1.11	0.53±0.52	1.14	0.00512

B.T – Before Treatment, A.T – After Treatment, MD – Mean Difference

The statistical significance of results was calculated from the "P" values of each parameter which helps in coming to a conclusion in assessing the efficacy of *Kadamba* bark and leaf powder. For the *Kadamba* bark powder in Group-A the "P" value observed in *Utsahahaani* (0.00096), *Kshudraswasa* (0.00096), *Atinidra* (0.00338), *Pipasaatiyoga* (0.00222), *Kshutatimatra* (0.00222), *Sandhisoola* (0.00064), *Angasaithilyam* (0.00512) and is statistically highly significant.

Table 5: Statistical Data Showing Symptomatic Relief Before and After Treatment with *Kadamba* Leaf Powder in Group-B

S.No.	Symptoms	MEAN ± SD		MD	P value
		BT	AT		
1	*Utsahahani*	1.80±0.94	0.33±0.49	1.47	0.00148
2	*Kshudraswasa*	1.87±1.06	0.20±0.41	1.67	0.00148
3	*Atinidra*	1.27±0.80	0.40±0.51	0.87	0.00338
4	*Pipasaatiyoga*	1.20±1.01	0.40±0.51	0.80	0.00512
5	*Kshutatimatra*	1.00±0.65	0.33±0.49	0.67	0.00512
6	*Sandhisoola*	2.27±0.80	0.33±0.49	1.93	0.00064
7	*Angasaithilyam*	1.60±0.91	0.40±0.51	1.20	0.00222

B.T – Before Treatment, A.T – After Treatment, MD – Mean Difference, SD – Standard Deviation

For *Kadamba* leaf powder in Group-B ''P" value observed in *Utsahahaani* (0.00148), *Kshudraswasa* (0.00148), *Atinidra* (0.00338), *Pipasaatiyoga* (0.00512), *Kshutatimatra* (0.00512), *Sandhisoola* (0.00064) *Angasaithilyam* (0.00222) and is statistically highly significant.

The effect of therapy showed maximum improvement of signs and symptoms with good response was observed in 46.67% of patients, moderate response was observed in 53.33% of patients in Group-A treated with *Kadamba* bark powder.

In Group-B maximum improvement of signs and symptoms with good response was observed in 60% of patients, moderate response was observed in 40% of patients treated with *Kadamba* leaf powder.

Objective Parameters: The percentage change or difference obtained in the objective parameters after the treatment with *Kadamba* bark powder, in Group-A is total cholesterol is 23.238%, HDL-Cholesterol is 24.468%, LDL-C is 26.236%, VLDL-C is 22.138%, Triglycerides is 25.927%.

With *Kadamba* leaf powder, in Group-B the objective parameters inferred the percentage change in total cholesterol is 24.811%, HDL-Cholesterol is 28.681%, LDL-C is 32.667%, VLDL-C is 43.718%, Triglycerides is 57.299 %.

Table 6: Response of Patients before and after Treatment With Respect to Lipid Profile In

Lipid profile (mg/dl)		Group-A *Kadamba* Bark		Group-B *Kadamba* Leaf	
		BT	AT	BT	AT
Total Cholesterol	N	3 (20%)	10 (66.67%)	3 (20%)	9 (60%)
	BL	4 (26.67%)	3 (20%)	1 (6.67%)	6 (40%)
	H	8 (53.33%)	2 (13.33 %)	11 (73.33%)	0
Triglycerides	N	8 (53.33%)	12 (80%)	5 (33.33%)	13 (86.67%)
	BL	1 (6.67%)	2 (13.33%)	0 (0%)	2 (13.33%)
	H	6 (40 %)	1 (6.67%)	10 (66.67%)	0(0%)
HDL	N	0	0	1 (6.67%)	4 (26.67%)
	D	9 (60%)	14 (93.33%)	8 (53.33%)	10 (66.66%)
	H	6 (40%)	1 (6.67%)	6(40%)	1 (6.67%)
LDL	N	0	6 (40%)	3 (20%)	6 (40%)
	D	4 (26.67%)	7 (46.67%)	1 (6.67%)	4 (26.67%)
	BL	3 (20%)	0 (0%)	1 (6.67%)	4 (26.67%)
	H	8 (53.33%)	2 (13.33%)	10 (6.67%)	1 (6.66%)
VLDL	N	9 (60%)	13 (86.67%)	10 (66.6%)	15 (100%)
	H	6 (40%)	2 (13.33%)	5 (33.33%)	0 (0%)

N-Normal value, D-Desirable, BL- Borderline High, H-High, AB-Abnormal

Table 7: Statistical Analysis of Lipid Profiles Before and After the Treatment in Group-A

Lipid Profile (mg/dl)	Mean		Change %	MD	t-value	p-Value
	BT	AT				
Total Cholesterol	233.53±26.49	179.27±37.43	23.238	54.27	8.3260	< 0.00001
HDL	41.40±6.23	51.53±6.14	24.468	10.13	5.2656	= 0.00001
LDL	157.53±32.06	116.20±28.36	26.236	41.33	8.1260	< 0.00001
VLDL	38.53±13.50	30.00±13.94	22.138	8.53	3.4731	=0.0037
Triglycerides	180.00±79.62	133.33±60.65	25.927	46.67	4.0378	=0.0012

B.T – Before Treatment, A.T – After Treatment, MD – Mean Difference

The statistical analysis of objective parameters showed that the "P" value of the lipid profile in Group-A including total cholesterol levels is <0.00001, on HDL levels is 0.00001, on LDL levels is <0.00001, on VLDL levels is 0.0037, on Triglycerides is 0.0012 which are conventionally extremely statistically significant for the entire lipid profile.

Table 8: Statistical Analysis of Lipid Profiles Before and After the Treatment in Group-B

Lipid Profile (mg/dl)	Mean		Change %	MD	t-value	p-Value
	BT	AT				
Total Cholesterol	237.27±39.33	178.40±39.41	24.811	58.87	7.6003	< 0.00001
HDL	40.20±3.86	51.73±7.96	28.681	11.53	6.1618	<0.00001
LDL	156.73±45.40	105.53±40.08	32.667	51.20	8.5095	< 0.00001
VLDL	38.13±12.82	21.47±4.24	43.718	16.66	6.0469	< 0.00001
Triglycerides	258.87±128.39	110.53±23.28	57.299	148.33	4.4837	=0.0005

B.T – Before Treatment, A.T – After Treatment, MD – Mean Difference

"P" value of effect of *Kadamba* leaf powder in Group –B patients on total cholesterol levels is <0.00001, on HDL levels is <0.00001, on LDL levels is <0.00001, on VLDL levels is <0.00001, on Triglycerides is 0.0005 which are extremely statistically significant for the entire lipid profile.

In Group-A normal lipid levels before treatment are present in none of the patients regarding to some particular lipid entities and after treatment 9 (60%) patients have normal lipid values. The abnormal lipid levels before treatment are present in 15 (100%) patients and after treatment 6 (40%) patients only have an abnormal lipid values. So it may be assumed that the treatment with *Kadamba* bark powder inferred the increase in the number of normal lipid level patients.

In Group-B normal lipid levels before treatment are present in none of the patients regarding to some particular lipid entities and after treatment 13 (8.67%) patients have normal lipid values. The abnormal lipid levels before treatment are present in 15 (100%) patients and after treatment 2 (13.33%) patients only have an abnormal lipid values. So it may be assumed that the treatment with *Kadamba* leaf powder inferred the increase in the number of normal lipid level patients.

Table 9: Comparative Overall Results Percentage Relief of the Cardinal Symptoms in Group A and Group B

Response of patients	Group A		Group B	
	No	%	No	%
Mild response	0	0	0	0
Moderate response	8	53.33	6	40
Good response	7	46.67	9	60
Total	15	100	15	100

Table 10: Comparative Overall Response of the Patients before and After the Treatment Based on Lipid Profile in Group-A & Group-B

Lipid Profile	Treatment with Bark No. of patients		Treatment with Leaf No. of patients	
	BT	AT	BT	AT
Normal	0 (0%)	9 (60%)	0(0%)	13(86.67%)
Abnormal	15 (100%)	6 (40%)	15(100%)	2(13.33%)

B.T – Before Treatment, A.T – After Treatment

Hence it may be assumed that drug *Kadamba* bark and leaf powder will be useful in reducing the total cholesterol, LDL-Cholesterol, Triglycerides, VLDL Cholesterol levels and increasing HDL-Cholesterol levels.

Probable Mode of Action

According to Ayurveda, the drug action is understood based on its composition like *Rasa Panchakas*. Due to its *Tikta, Kashaya rasas, Kadamba* has *Lekhana* property, *Ruksha guna* acts as *Kapha hara* and *Sosana* and *Katu vipaka* acts as *Kapha samaka* because of these properties it acts as *Medohara*. *Tikta Rasa* has the property of *Ama pachana* and thus they are capable of rectifying digestion and metabolism at different levels in order to achieve *Dhatusamyata* and *Mala samyata.* Thus reducing the lipids i.e., cholesterol levels bringing into normal state.

CONCLUSION

Both bark and leaf of *Kadamba* were effective in bringing back the symptomatology explained in Ayurveda for *Medoroga* and the abnormal lipid profile to normalcy laid down in modern classics with special reference to Hyperlipidaemia. But by statistical analysis it can be concluded that leaf is little more efficacious than bark in relieving signs and symptoms of *Medoroga* and bringing back the normalcy of lipid profile. I conclude that *Kadamba (Anthocephalus cadamba* (Roxb.) Miq) bark and leaf are clinically effective in *Medoroga* and leaf is little more efficacious than bark and it is a drug of choice in the management of *Medoroga*. This humble trial was conducted in a small sample with limited parameters. There is need for further research in large samples with more parameters for analyzing its efficacy in *Medoroga* which will be beneficial to the humanity at large.

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